Chapter 11 – Hypothesis Testing

There are 2 hypotheses:

(1) Null Hypothesis, H_0, is the assumed true (status quo, it has always been this way) hypothesis.

The form is always H_o: $\mu = \mu_o$.

Court Analogy: The defendant is assumed innocent.

(2) Alternative Hypothesis, H_1, is what is being tested (the opposed view being examined)

1 of 3 forms:

(1) H_1: $\mu > \mu_o$, (greater than) (2) H_1: $\mu < \mu_o$, (less than) or

(3) H_1: $\mu \neq \mu_o$ (any difference).

Court Analogy: The defendant is guilty.

As a prosecutor, we would try to prove the alternative beyond a reasonable doubt (usually we will set this at 5%). We can make errors in this process:

Decision	H_0 is true	H_0 is false
Reject H_0	Type I Error	Correct
Fail to Reject H_0	Correct	Type II Error

A Type I Error is made when we reject a true null hypothesis.

(Court: Send an innocent person to jail)

α = P(Type I Error) = P(Reject a true H_o)

A Type II Error is made when we fail to reject a false null hypothesis.

(Court: Fail to convict a guilty person)

β = P(Type II Error) = P(Fail to Reject a false H_o)

When we have a fixed sample size, then α and β are inversely related. As one increases, the other decreases. We will begin by limiting how willing we are to falsely reject H_o. ($\alpha = 0.05$)

Steps for a Hypothesis Test:

1. State the null (H_o) and alternative (H_1) hypotheses. It is better to state H_1 first.
2. Define the form of the test statistic (for now, $Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$)
3. Take the sample and compute the observed value of the test statistic (Z for now).
4. Compute the p-value.
5. Make a decision (two choices):

   If $p \leq \alpha$, then reject the null hypothesis.

   If $p > \alpha$, then fail to reject the null hypothesis.
6. Interpret the results using Figure 11.6 on p.329. This is in terms of H_1 (in English, not in symbols).